DOCUMENT RESUME

ED 471 050 UD 035 379

AUTHOR	Carey, Kevin
TITLE	Education Funding and Low-Income Children: A Review of Current Research.
INSTITUTION	Center on Budget and Policy Priorities, Washington, DC.
PUB DATE	2002-11-05
NOTE	20p.
AVAILABLE FROM	Center on Budget and Policy Priorities, 820 First Street, N.E., Suite 510, Washington, DC 20002. Tel: 202-408-1080; e-mail: center@cbpp.org. For full text: http://www.centeronbudget.org.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Academic Achievement; Early Childhood Education; *Educational Finance; Elementary Secondary Education; *Financial Support; *Low Income Groups; Minority Group Children; *Poverty; Small Classes; Teacher Competencies

ABSTRACT

This paper examines the results of current research on education funding for low income children, noting findings in three areas: the overall relationship between education funding and student performance, recent estimates of the amount of additional funding needed to narrow the poverty-based academic achievement gap, and specific resource-intensive strategies that have been shown to benefit students in general, and low income students in particular. Results indicate that student achievement is linked to school funding levels; claims that large increases in school funding have already been made are overstated; claims of stagnant achievement growth are overstated; schools need significant additional funds to educate low income students; and schools can use additional funds for low income students to implement resource-intensive educational improvement strategies that have been shown to improve student achievement (including class size reduction, improved teacher quality, and early childhood education). (SM)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 471 050

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

P.S. deLeynier
Center on Budget and Policy Priorities

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

CENTER ON BUDGET AND POLICY PRIORITIES

820 First Street, NE, Suite 510, Washington, DC 20002
Tel: 202-408-1080 Fax: 202-408-1056 center@cbpp.org http://www.cbpp.org

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

November 5, 2002

EDUCATION FUNDING AND LOW-INCOME CHILDREN: A REVIEW OF CURRENT RESEARCH

by Kevin Carey

Overview

The academic achievement gap between poor and non-poor students is well-known. Low-income children consistently fall behind their peers in test scores, graduation rates, college enrollment, and other measures of academic success. Both state and federal policymakers have recently made significant efforts to adopt reforms designed to address this problem. Some reforms have focused on creating high standards of achievement coupled with systems of testing and accountability. Other reforms have focused on improving the quality of education for low-income students by targeting additional financial resources to the school districts that serve them to improve instruction, facilities, and other academic resources. A significant body of research suggests that targeting additional resources to districts serving low-income children can narrow the academic achievement gap between poor and non-poor students.

This paper reviews and summarizes the results of current research on education funding for low-income children. It examines the findings of researchers and analysts in three areas: the overall relationship between education funding and student performance; recent estimates of the amount of additional funding necessary to narrow the poverty-based academic achievement gap; and specific resource-intensive strategies that have been shown to benefit students in general and low-income students in particular. The most recent, comprehensive studies indicate that school funding and student performance are strongly related. In particular, they find that low-income children can substantially benefit from policies designed to provide additional resources to high-poverty school districts. New research, however, indicates that the *amount* of additional resources necessary to reduce the achievement gap is significant and may not be reflected in current state funding policies. The research findings are summarized below:

- **Student achievement is linked to school funding levels.** While some researchers in the 1980s and 1990s suggested that school funding levels and student achievement are largely unrelated, more recent studies have contradicted this claim. A comprehensive review of over 60 statistical analyses that examine the link between school inputs, such as funding levels and student poverty rates, and school outcomes, such as test scores and graduation rates, indicates that school funding and student performance are strongly related.

- **Claims that large increases in school funding already have been made are overstated.** Some analysts have suggested that inflation-adjusted, per-student education spending in the United States has more than doubled since the late 1960s, while student performance has remained stagnant, indicating a decline in

UD 035 379

BEST COPY AVAILABLE

educational "productivity." However, measures of inflation that account for the service-oriented nature of public education show smaller increases in school funding levels because services have risen in cost faster than most common measures of inflation. Moreover, most of the real increases in education spending have been in areas such as special education, where one would not expect the additional expenditures to result in improved performance on standardized tests or similar measures of student performance.

- **Claims of stagnant achievement growth are overstated.** Calculations of slow growth in student achievement on tests like the National Assessment of Education Progress fail to account for the fact that the student population has changed over time. Since 1970, the national child poverty rate has increased, while the dropout rate has declined, meaning that more students are poor and fewer academically-marginal students are dropping out of school. While the average SAT score declined during some time periods, this was influenced by the fact that the percentage of all students taking the SAT has risen steadily. As schools have successfully increased student participation in college, a greater number of moderate-achieving students are taking the SAT, affecting the average score.

- **Recent research indicates that schools need significant additional funds to educate low-income students.** Both the federal government and most states have adopted funding policies that provide additional money to school districts based on poverty rates. Recent years have seen policymakers and researchers use a variety of different methods to determine the amount of money necessary to fully close the poverty-based academic achievement gap. By examining funding levels in successful schools, using teams of experienced educators to develop model education systems, and performing statistical analyses of school resources, poverty rates, and academic achievement, researchers in different states have reached similar conclusions: in order to reduce significantly the academic achievement gap, school districts need funding for poor students equal to two to two-and-a-half times of the cost of educating non-poor students. These amounts are much greater than the supplemental amount provided by any state prior to 2002.

- **Schools can use additional funds for low-income students to implement specific resource-intensive education improvement strategies that have been shown to improve student achievement**. Recent studies indicate that certain resource-intensive school improvement strategies significantly increase student performance, particularly among low-income students. For example, class-size reduction programs, when properly funded and implemented, have resulted in substantial, lasting improvements in student achievement. Poor and minority students showed greater benefits than non-poor students in prominent class-size reduction programs implemented in Tennessee and Wisconsin. While the results of class-size reduction in California have been mixed, problems with the program

have been largely the result of flaws in implementation, including insufficient funding, setting target student–teacher ratios above effective levels, and not finding enough teachers in the job market to support rapid implementation.

Numerous other studies have confirmed the relationship between student achievement and indicators of teacher quality, including education, experience, and ability. Schools looking to improve teacher quality would likely need significant resources for training and education of their existing workforce or for recruitment and hiring of additional high-quality teachers. Early childhood education has also been shown to help students in general and low-income students in particular. Researchers have linked differences among the states in test scores with the utilization of universal pre-kindergarten programs, while programs like "Head Start" boost test scores, reduce the need for special education, and increase graduation rates.

These research findings collectively show both great opportunities and significant challenges for policymakers seeking to improve academic achievement among low-income students. The best evidence suggests that providing additional funding to school districts and targeting resources to cost-intensive strategies of proven effectiveness can significantly enhance educational success, particularly for poor children. However, the resources necessary to close the poverty-based academic achievement gap are substantial. Policymakers and researchers will be challenged to identify the most effective use of scarce resources to improve the quality of public education and provide low-income children with the opportunity to achieve academic success.

The Link Between School Funding and Student Performance

School funding issues are usually a prominent feature of state and local budget discussions, as policymakers debate both the amount money to spend on education and the best way to allocate education funds among various school districts. Many states have been and continue to be involved in protracted, hard-fought legal battles over their school funding systems. Implicit in these debates and discussions is the idea that the decisions being made *matter* — that the ability of schools to educate their children effectively is affected by the amount of resources at their disposal. The idea that this is *not* the case — that the size of a school's budget has little or no bearing on the success of its students — is scarcely considered by the parents who closely monitor the educational experience of their children or the school administrators charged with managing public funds. It also contradicts the evidence of the private market for elementary and secondary education, in which families of means pay annual tuition to private schools that far exceed public per-student funding levels. These families presumably believe they are getting something for their money, in the form of a high-quality education for their children.

Yet for a number of years there has been a steady debate centered around the essentially counter-intuitive idea that the relationship between school resource levels and student performance is weak or non-existent. This idea was widely discussed in the mid-1960s with the

publication of the "Coleman Report," a federally-sponsored study of schools and students. The report suggested that while educational achievement was highly dependent on family and student characteristics, the quality of the school itself was less important.[1] While later studies suggest that the methodologies used in the Coleman report were seriously flawed, the idea that schools have a limited ability to improve student achievement — and the questionable value of spending more money to improve education that this limitation implies — has remained a part of education funding discussions ever since.[2]

Some analysts who question the link between resources and school performance have simply made general observations regarding the overall growth in national K-12 education spending compared to the growth in the average level of student achievement, as measured by certain test scores. For example, some researchers concluded that inflation-adjusted per-student spending on public education doubled between 1967 and 1991. The fact that student test scores — usually the reading and math scores found on the SAT or the National Assessment of Education Progress — did *not* double over the same time period was termed a "productivity collapse" in American public education. Subsequent analyses, however, suggest that claims of rapid spending growth and stagnant achievement are overstated, failing to reflect the complex, changing nature of the student population being educated and the manner in which public education dollars are utilized.

Changes in Education Expenditures

The growth of nationwide education spending over time was addressed in a report published by the Economic Policy Institute in 1995.[3] The report reached two main conclusions:

1) Inflation-adjusted per-student spending did not double between 1967 and 1991, but rather increased by an amount substantially less than that.

2) Most of the real increase in spending that did occur was for costs not directly related to the "regular" student instruction expenditures that most contribute to improvement in standardized test scores.

In addressing the issue of overall spending growth, the report challenges the use of the Consumer Price Index to adjust calculations of the growth in education spending. The report notes that the goods and services purchased by consumers and measured by the CPI are much different than the goods and services commonly purchased by public schools. Specifically, schools spend most of their money on services, in the form of hiring teachers and other educational staff, while consumers spend a larger portion of their income on purchasing goods, such as food, clothing, and shelter. The relative use of goods and services is significant to estimates of changing price levels over time, because the price of services has increased faster than the price of goods. Thus, the CPI, which is more heavily weighted toward goods than actual school spending patterns, understates the real cost increases experienced by schools. Using a price index more weighted toward the service sector, the report concludes that inflation-adjusted per-student spending increased by 61 percent between 1967 and 1991, not 99 percent.

The second part of the report explores the sources of the 61 percent increase, using a case-study approach to conduct a detailed study of nine school districts representing a variety of characteristics — large, small, urban, rural, etc. The study found that of the real increase in funding that did occur in those school districts between 1967 and 1991, only 25.9 percent was dedicated to "regular instruction." The largest share of the increase was for special education, making up 38.0 percent of new per-pupil spending. This is consistent with long-term national enrollment trends in which there is an increase in the proportion of students identified as having disabilities that require expensive special education services.

While many of these "non-regular" areas of expenditure, which contributed to much of the real growth in education spending, were made in pursuit of legitimate education goals, they are often less focused on activities tied to improving standardized test scores. Students served by special education programs, for example, are often excluded from such tests. A follow-up study of spending from 1991 to 1996 found the pace of real growth in per-student spending slowing significantly, partially because an increase in student enrollment reduced funding on a per-student basis.[4] Taken together, these studies suggest that claims of a massive investment of new public resources in public education are largely overstated. The most appropriate measurements of inflation indicate a smaller growth in real education spending, while the majority of the increases that did occur were for educational purposes other than regular instruction.

Changes in Student Performance

The evidence suggests that school expenditures for instructional improvements have not grown as rapidly as the overall rate of school spending growth, but some real increases in instructional expenditures have occurred. Some analysts have examined the change in standardized test scores over the last few decades, arguing that the scores on the SAT and the NAEP should have increased given the increased public investment in education. There are pitfalls, however, in attempting to make that type of one-to-one correlation.

For example, one of those tests — the SAT — has serious flaws as a measure of national educational achievement. SAT test-takers are not representative of the nation's student body as a whole because only a minority of students take the SAT in any given year and those that take the test are significantly different from those that do not. Participation also varies widely among the states (eighty-one percent of graduates took the 2001 SAT in New Jersey, compared to six percent in Wisconsin) because some states focus on the ACT test instead.

Furthermore, as college participation rates have increased, more students are taking the test. Thirty-four percent of high school graduates took the SAT in 1972, compared to 45 percent in 2001.[5] Since the additional test-takers are likely to be those at the margins of college participation — students that in earlier years might have settled for a high school diploma and not gone on to college — their inclusion would reasonably result in a decline in the average score. Thus, the fact that SAT scores declined somewhat from the mid-1960s to the early 1990s (they have since increased) can be seen as a sign of success in increasing college aspirations.

Scores on the NAEP offer a better perspective on student achievement and raise legitimate questions about long-term performance trends. Administered through the U.S. Department of Education, NAEP tests in reading, science, and mathematics have been given to 9-, 13-, and 17-year old students since 1973. Unlike the SAT, NAEP tests are given to a representative sample of the U.S. student population and allow for comparisons of test scores over different time periods.

NAEP scores increased modestly in all three subjects for 9- and 13-year old students between 1973 and 1999.[6] Math scores for 17-year old students also increased during that time period, while changes in reading and science scores for 17-year old students were statistically insignificant. Critics have pointed to relatively flat NAEP scores as evidence of ineffective use of resources by public schools. Some researchers have speculated that the lack of improvement in scores among 17-year old students compared to those among 9- and 13-year old students is related to the lack of attention that high school seniors may give to the results of a test that carries no academic consequences.

In addition, a number of analysts have noted that the nature of the student population taking the NAEP has changed over time.[7] For example, the high school drop-out rate steadily declined from 14.1 percent in 1973 to 10.9 percent in 2000, presumably meaning that more academically-marginal students were enrolled in 2000 to take the 17-year old test.[8] Meanwhile, the child poverty rate increased from 14.4 percent in 1973 to 20.0 percent in 1980 and remained above 19.5 percent in every year until 1998, meaning that a higher percentage of children taking the test in later years experienced the negative effects of poverty.

Researchers have also observed demographic changes in the U.S. student population over time. The increase in NAEP scores for both black and Hispanic students was larger than the increase for white students from 1973 to 1990. However, the test score increases among minority students were not reflected in similar improvements in the *average* score because black and Hispanic students, whose average score is lower overall, made up a larger percentage of test-takers in 1990 than in 1973.

In summary, there is substantial reason to believe that claims of a "productivity collapse" in American public education are significantly overstated. The real increases in spending on regular instructional activities has been significantly lower than some have suggested, while test scores have been influenced by the changing nature of the student population.

Statistical Analyses of Education Funding and Student Achievement

A number of researchers have tried to resolve the issue of school resources and student achievement by applying techniques that are more sophisticated than simple observation of long-term trends in overall education spending and student achievement. Analysts have used statistical regression analysis to study the relationship between school characteristics, such as funding levels and student teacher ratios, student characteristics, such as the makeup of the student body in terms of income, race, and ethnicity, and school outcomes, such as test scores

and graduation rates. In the 1980s, an economist named Eric Hanushek attempted to summarize the results of a number of these so-called "production-function studies" by looking at the statistical measurements that indicate the relationship between school funding and student performance. He noted that some measurements indicated a positive relationship (that more money produces better performance), that some indicated a negative relationship, and that many showed no statistically significant relationship at all. His conclusion was, "There is no strong or systematic relationship between school expenditures and student performance."[9] This conclusion drew a great deal of attention, as it appeared to provide scientific backing for the idea that funding was being directed to public schools without concrete results.

Other researchers have raised doubts about the underlying methodology of the Hanushek analysis. The essence of the criticism is that the method of counting statistical measurements from different studies was flawed in a way that over-represented studies that indicate no significant relationship between spending and performance.[10] More recent summaries suggest that statistical analyses of school inputs and outcomes collectively point to a strong positive relationship between school funding and student performance. University of Chicago researchers produced a comprehensive study of analyses produced since the mid-1960s, examining over 60 peer-reviewed studies of U.S. school outcomes at the school district level or smaller.[11] The analyses studied were limited to those that controlled for variations in student ability or background, and examined factors including per-pupil expenditures, teacher ability, teacher education, teacher experience, teacher salary, student / teacher ratio, and school size. The study concluded:

> "The analysis found that a broad range of resources were positively related to student outcomes, with effect sizes large enough to suggest that moderate increases in spending may be associated with significant increases in achievement."

It should be noted that in almost every case the analyses summarized in this study examined overall educational outcomes for all types of students. Other researchers have attempted to further refine their understanding of the relationship between school funding and student performance by working to identify the resource levels necessary to attain specified achievement levels for specific subsets of the student population. Some student populations are more likely than others to be at risk of academic failure, resulting in different levels of additional resources needed to produced significant improvement. Given the persistent achievement gap among low-income students, the relationship between student poverty and school resources has received significant attention.

The Cost of Closing the Low-Income Achievement Gap

The research findings reviewed above indicate that student performance is related to the amount of money schools receive. Thus, it is reasonable for those interested in working toward significant improvement in educational achievement for low-income children to advocate for

increased funding for the school districts that educate those children. The question then becomes: How *much* additional money is required?

A substantial amount of research has been conducted in recent years to try to answer that question in an objective, unbiased fashion. The answer is often expressed in percentage terms, in a statement that school districts need, on average, supplemental funding for each low-income student equal to some percentage of regular, "base" funding amounts in order to compensate for the educational barriers associated with poverty. This approach is consistent with the formulas that states generally adopt to provide funding to school districts. Students that fall into certain categories (i.e. special education, limited English proficiency, etc.) are assigned additional funding "weights," or percentages, that are then multiplied by standard per-student funding amounts to generate overall funding levels. The percentage assigned to low-income students is often termed the "poverty weight."

Analysts studying the issue of the appropriate size of poverty weights often begin by examining funding weights currently in use. Thirty-eight states currently provide some amount of state funding to school districts based on local poverty levels. Those states that provide a uniform percentage supplement per poor child utilize poverty weights that range from five percent to 26 percent.[12] The most commonly-used single poverty weight is 25 percent. Some states vary the per-student weight depending on the overall poverty level of the district, providing high-poverty districts with more per-student funding than low-poverty districts.

The fact that some policymakers have chosen a poverty weight of 25 percent as their estimate of the additional cost of educating low-income students does not necessarily make that amount representative of actual school district needs. In state fiscal environments in which resources are limited, policymakers often first determine the total level of resources available to assist low-income children, and then adopt poverty weights that generate funding in that amount, even if those weights fall short of the actual cost of educating low-income students. Nevertheless, even if policymakers do not immediately have the resources to address fully the needs of poor children, it can be important to understand the relationship of current funding to need.

A number of researchers have recently sought to address this issue. Methods of determining the true cost of educating low-income students have been categorized as being based on either "empirical identification," "professional judgement," or "statistical analysis."[13] The empirical identification approach involves observing actual spending levels in school districts that are meeting educational goals. Professional judgement analyses rely on the opinions of experienced educators to determine the resources and services necessary for a hypothetical "ideal" school environment in which students can achieve success. Statistical analyses utilize regression analysis and other techniques to determine the statistical relationship between various measurement of students characteristics, school funding levels, and educational outcomes.

The empirical identification approach is the simplest and probably the most intuitive. It involves identifying actual school districts that have met specified performance standards and observing their funding levels. Districts that meets performance standards are assumed to be

sufficiently funded, by definition. This amounts to a "best practices" survey of existing schools and can be used to establish "baseline" funding levels that are demonstrably associated, under certain conditions, with educational success. Such an approach was used in Ohio in the mid-1990s. While this "successful schools" approach takes the important step of grounding education finance policy in something more substantial than the simple intuition and judgement of state policymakers, its value is somewhat limited by insensitivity to differences in student populations. If, for example, a successful school has a very low poverty rate, it may be difficult to extrapolate from its fiscal circumstances the amount of money necessary to achieve similar success in a school with a very high poverty rate.

A blue-ribbon commission of experts in Maryland recently charged with formulating recommendations for reforming the state's system of education finance combined the empirical identification approach with the professional judgement approach. The commission began by establishing the educational outcomes that school districts should achieve, defined by standardized test scores, attendance rates, and graduation rates. The empirical identification approach was used to establish base per-student funding levels common to all schools, by documenting spending levels in schools that were meeting the defined performance standards. The commission then employed the professional development approach to determine "a series of adjustments to the base to reflect the cost pressures associated with different pupils, different programs, or different characteristics of school districts. The professional judgement approach uses multiple panels of educators to determine the kinds of resources needed to achieve a particular set of objectives in prototypical elementary, middle, and high schools. The resources identified by the panels are then 'priced out' based on salary levels and other factors to determine per pupil costs."[14]

Initial results of the study indicated that the cost of educating low-income students produced the need for a supplemental poverty weight of 139 percent, or *more than twice* the base per-student cost of education. As this amount was integrated with the recommended funding for other student categories, such as special education and limited English proficiency, the final recommended supplemental weight was 110 percent, reduced to account for overlap between the different student populations. This formula formed the basis for legislation that was passed by the Maryland legislature and enacted into in law in May 2002. The final reform package included a 97 percent supplemental funding weight for low-income children. The legislation calls for $1.3 billion in new education funding when fully implemented, benefitting high-poverty school districts like those found in the city of Baltimore.[15]

Researchers using the third approach, statistical analysis, perform regression analyses on data sets that include information on student characteristics (e.g. low-income, special needs) and school characteristics (e.g. per-student spending, class sizes) to determine the link between those factors and educational outcomes (e.g. graduation rates, standardized test scores). For example, a statistical analysis of 1994-95 funding levels, demographics, and educational performance data from Wisconsin's 368 school districts allowed researchers at the University of Wisconsin-Madison to estimate the cost of education for each school district, based on the different kinds of

students enrolled.[16] Those estimates resulted in a poverty weight of 159 percent. The authors noted that,

> "A poverty weight of 159 percent indicates that to achieve any given level of educational outcomes costs two and a half times as much money as required to educate a regular student. The fact that our poverty weight is considerably larger than the largest weight used by those states that include such weights in their equalization aid formulas, suggests that these other states underestimate the true costs of educating poor children."

A similar analysis conducted by a researcher at Syracuse University examined education data from the 1999 - 2000 school year in the state of New York.[17] The study calculated the extra cost to school districts of bringing low-income students up to the average level of statewide academic performance, as measured by a composite measurement of math and reading test scores in the 4th grade, 8th grade and state regents examinations. The extra cost was estimated to be almost twice that of educating non-poor students, producing a supplemental funding weight of 97 percent. The author noted that,

> "...these results would suggest that most states are significantly underestimating the additional resources that are required to support at-risk students achieving higher standards."

The fact that the funding weights developed for low-income students in these various studies range in size significantly is indicative of the evolving nature of this research. But it is striking to note that all of the studies — using different analytical approaches — produced estimates of the additional cost of educating low-income students that greatly exceed those reflected in the actual funding policies adopted by *any* state prior to 2002. This indicates that there is significant room for states to implement or improve poverty-based education funding policies to better reflect the true cost of closing the achievement gap among poor children.

Simply increasing funding, however, may not be sufficient in and of itself. States may also seek to improve outcomes by targeting funds to educational strategies that have proven to be most effective in serving children generally and low-income children in particular. Not all uses of money are equally effective; to maximize the utility of additional resources, schools that serve poor students can target funds to educational improvement strategies that hold the highest promise for lasting gains in academic achievement.

Resource-Intensive School Improvement Strategies That Enhance Student Performance

The relative effectiveness of various education improvement strategies have also been subject to extensive analysis and research. The comprehensive study of various statistical analyses of the link between school resources and student achievement produced by University of Chicago researchers defines "resources" broadly, looking not just at general per-student spending

levels, but also at specific school factors or education improvement strategies.[18] If research demonstrates a relationship between a specific school improvement strategy and student performance, and the strategy costs money to implement, this provides additional evidence that school spending affects student performance. Three resource-intensive school improvement strategies often associated with positive results are class-size reduction, improved teacher quality, and early-childhood education. Research concerning the relationship between these strategies and student performance is summarized below.

Class-Size Reduction

Two things are certain about class-size reduction — it is very popular, and it is very expensive. Private schools tout small student-teacher ratios and "individualized instruction" as prime selling points, while initiatives to significantly decrease class sizes have been launched in a number of states. However, creating smaller class sizes is costly. Schools spend most of their money on building classrooms and staffing them with teachers. Any significant change in class sizes will result in a correspondingly significant change in those costs.

High public interest and the potential for major cost increases have led to a significant body of research on class-size reduction. While the results are not completely uniform, the weight of research suggests that significant reductions in class sizes can have substantial and lasting positive effects on students, particularly low-income students. But research also suggests that class-size reduction must be implemented prudently, or problems and unintended consequences can result.

Experiences in three states provide instructive examples of class-size reduction policies and benefits. The most significant and widely-studied experiment in lowering class sizes was conducted in Tennessee. Beginning in 1985, the Student Teacher Achievement Ratio project involved over 6,000 students in grades K-3 who were randomly assigned to either a "regular" class of 22 - 26 students with one teacher, a class of 22 - 26 students with a teacher and an instructional aide, or a low-size class of 13 - 17 students with a teacher. Results published by the Tennessee Department of Education showed significant increases in academic achievement for students in the smaller classrooms, relative to the achievement of the students in the "regular" classes.[19] By contrast, positive results were not found for the regular-size classes that were given an additional instructional aide.

The analysis of the STAR Project found that minority and low-income students benefitted more from class-size reduction than other students. Although the students in the STAR Project returned to regular classrooms after the third grade, follow-up studies have indicated benefits lasting well beyond the early years in areas such as drop-out rates, class rank, and enrollment in advanced courses. One study reported that STAR participants were more likely to eventually take college entrance exams.[20] As with the earlier test scores, this effect was more pronounced for minority and low-income students.

Another significant class-size reduction effort is currently being conducted in Wisconsin. Begun in 1996, the Student Achievement Guarantee in Education program was designed to provide small class sizes of 15 or fewer students for high-poverty school districts. Initial funding of $2,000 per student was targeted to schools with at least a 30 percent student poverty level. Results from participating schools were compared to a group of demographically similar comparison schools. Program evaluations conducted by the University of Wisconsin-Milwaukee Center for Education Research, Analysis, and Innovation have found significant benefits for children in the smaller classrooms, particularly minority students.[21] The most recent evaluation noted:

> "The classroom level data on the averaged performance of first-grade students in 1996-97 and 1997-98 SAGE classrooms suggested that the lower student-teacher ratio in SAGE classrooms mitigated the negative achievement consequences of poverty. SAGE classrooms achieved at a higher level than Comparison school classrooms despite the fact that, as a group, SAGE classrooms enrolled more students who were eligible for subsidized lunch."

The state of California also moved to lower class sizes in 1996 with its Class-Size Reduction program, although it may provide more of a cautionary tale than the experiences in Wisconsin and Tennessee. While class-size research suggests that student–teacher ratios must be lowered to approximately the 15-to-one level to produce real benefits, the California initiative called for a reduction to 20-to-one. To some extent, this was a result of the fact that class sizes in California at the time the initiative began were in the range of 28-to-one, above average compared to other states, so the cost of moving them below a 20-to-one level may have been prohibitive. Rather than providing a limited number of schools with significant fiscal resources to implement class-size reduction, the CSR program offered smaller per-student funding amounts ($650, compared to the $2,000 supplement in Wisconsin) to any district that agreed to provide the specified student–teacher ratio.

Critics have pointed to a number of unintended consequences of this approach. Some have suggested that a rush to hire new teachers to achieve the target ratio has *reduced* the quality of instruction because a tight job market forced schools to hire less-qualified teachers in order to meet target ratios, particularly in high-poverty school districts. Others have suggested that because the per-student grant provided was insufficient to cover the cost of the target class size, districts have filled the gap by internally shifting funds from other needed services.

Without the benefit of control or comparison groups, it has been difficult for researchers to isolate the impact of CSR on student achievement. In addition to noting the difficulties mentioned above, an assessment performed by a research consortium charged with evaluating the CSR program showed that elementary test scores in California have improved annually since CSR was implemented in 1996, but that it could not be conclusively demonstrated that the improvement was a direct result of the program itself.[22] Another analysis found that reduced class sizes increased student performance in reading and math, and that schools with more low-income students were likely to receive larger benefits.[23] That analysis also noted negative effects

associated with less-qualified teachers. California's experience suggests that meaningful class-size reduction is not easy. But it should be noted that problems with California's program are primarily associated with the *implementation* of smaller class sizes, not the *practice* of smaller class sizes.

In addition to analyses of specific state initiatives, several empirical studies of natural class-size variation among schools and districts support the benefits of class-size reduction. A student-level study of teacher and classroom characteristics in Alabama published by the Brookings Institution in 1996 concluded that lower class sizes in early grades were linked to higher test scores, particularly in math.[24] A 50-state study of NAEP scores published by the RAND Corporation in 2000 found that pupil-teacher ratios were among the statistically significant variables explaining variations in performance among states serving similar student populations.[25]

Improving Teacher Quality

Few would disagree that student performance is related to teacher quality. As a result, recent years have seen states spearhead initiatives including new funding for teacher professional development, improved pre-service education and training, and the creation of new processes for teacher certification and licensure. Studies have sought to identify specific aspects of teacher quality, such as education, experience, and aptitude, and correlate them with student performance. While the results vary in some respects, they affirm the essential relationship between teacher quality and student success. For example:

- The survey by University of Chicago researchers of numerous statistical analyses of school inputs and outcomes documented a variety of analyses indicating a positive, statistically significant relationship between student outcomes and factors related to teacher quality, including experience, salary level, education, and ability.[26]

- The Brookings Institution analysis of education in Alabama concluded that, "...student-level analysis supports the view that various measurable school inputs affect student learning. In particular, teacher quality — as measured by test scores and the proportion of teacher's with master's degrees — and class-size appear to affect learning."

- A 1999 analysis of state NAEP scores and data from the U.S. Department of Education's "Schools and Staffing Survey," the largest nationwide survey of school personnel, found that, "Teacher quality characteristics such as certification status and degree in the field to be taught are very significantly and positively correlated with student outcomes."[27]

- An 1991 analysis of student test score data in Texas published in the Harvard Journal on Legislation showed a positive relationship between student

achievement and teacher characteristics including experience, education level, and scores on the Texas Examination of Current Administrators and Teachers, a test of basic literacy.[28]

- An 2002 study conducted through the University of Texas at Dallas Texas Schools Project, based on a large set of individual student achievement data, concluded: "...having a high quality teacher throughout elementary school can substantially offset or even eliminate the disadvantage of low socio-economic background."[29]

It is important to note that not all studies find significant relationships between every potential measure of teacher quality and school performance. The *degree* of importance varies as well; some indicators of teacher quality (e.g., experience, education, and certification scores) show a stronger correlation to student achievement than others. But the weight of the research clearly indicates that measurable indicators of teacher quality correspond with student success.

Schools that wish to improve student performance by enhancing teacher quality are essentially limited to two options: 1) improve the quality of their current workforce, or 2) go to the job market to hire better teachers. Improving the skills of existing teachers could require new investments in teacher training, higher education, or other professional development activities. Hiring new, better teachers would require additional expenditures for recruitment, salaries, and benefits. In addition, some policymakers have suggested that teacher quality can be augmented through institutional reforms such as changes in systems of teacher compensation, evaluation, and licensure.

Early Childhood Education

There is general agreement that quality educational services for young children can help prevent the need for costly remedial instruction in later years. Students who experience early success in mastering fundamental skills will progress through the grades more easily than those who fall behind early on and struggle to catch up. These ideas are reflected in various programs aimed at students in the early grades. In programs including the federally-subsidized "Head Start" program and the previously-mentioned class-size reduction programs targeted at early grades, policymakers have chosen to invest resources in young children with the expectation of long-term dividends in student achievement. Some states that once began public education with optional, part-time Kindergarten classes now fund both full-day Kindergarten and earlier preschool education. In 1970, 37.5 percent of children aged three to five were enrolled in preschool or Kindergarten programs, 83 percent on a part-time basis.[30] By 2000, 64 percent of children were enrolled in preschool or Kindergarten, only 47.2 percent on a part-time basis.

Research indicating a positive relationship between early childhood programs and student achievement includes the following:

- The RAND study of state NAEP scores reported a positive relationship between test scores and participation in public pre-kindergarten programs, after adjusting for differences among the states in student socio-economic characteristics.

- A survey of numerous studies of early-childhood intervention programs for low-income children such as Head Start challenged the conventional wisdom that the benefits of such programs quickly fade over time. The survey found that many analyses show statistically significant test score gains beyond the early grades. The survey also notes that early-childhood programs appear to have an even greater impact on other important measurements of school progress such as graduation rates, propensity to be identified as needing special education services, and tendency to repeat grades. The benefits of early childhood programs in these areas were found to be "uniformly positive and overwhelmingly statistically significant."[31]

- One of the few studies of the effectiveness of preschool programs to combine random-assignment protocols with long-term follow-up among program participants found that economically disadvantaged children who participated in preschool programs in Ypsilanti, Michigan experienced greater academic achievement through the high-school years, as well as lower adult criminal activity, participation in welfare programs, and unemployment.[32]

Similar to class-size reduction and enhanced teacher quality, early childhood education initiatives have demonstrable benefits for students. And like those initiatives, early childhood education requires significant resources to implement, in the form of teachers, staff, and facilities.

In part because research suggests that class-size reduction, enhanced teacher quality, and early childhood education can improve the quality of educational outcomes for children, a number of states have chosen to specifically target funds to low-income children for these purposes.[33] States such as Indiana, Ohio, Virginia, and Wisconsin target class-size reduction funding to high-poverty school districts, while states including Arizona, New Jersey, and Texas provide early childhood education funding for low-income children. Many of these programs were first implemented during the last ten years, suggesting that state policymakers are actively working to focus educational resources on strategies that have proven to be effective.

The three education improvement strategies described above do not represent the only effective means of improving educational outcomes for low-income children. States have also implemented programs such as extended building hours for after-school programs, intensive reading instruction in the early grades, family literacy programs to promote positive home learning environments, enhanced summer school programs, and a variety of other initiatives. The multiple academic studies demonstrating the effectiveness of class-size reduction, enhanced teacher quality, and early childhood education support the broader conclusion that additional, well-implemented resources can produce substantive benefits for low-income students.

29.Steven G. Rivkin, Eric A. Hanushek, and John F. Kain, *Teachers, Schools, and Academic Achievement*, University of Texas-Dallas Texas Schools Project, 2002.

30.*Digest of Education Statistics 2001,* Table 43, U.S. Department of Education, National Center for Education Statistics, 2002.

31.W.S. Barnett, "Preschool Education for Economically Disadvantaged Children: Effects on Reading Achievement and Related Outcomes," *Handbook of Early Literacy Research*, 2001.

32.As described in Karoly, Lynn A, Peter W. Greenwood, Susan S. Everingham, Jill Hoube, M. Rebecca Kilburn, C. Peter Rydell, Matthew Sanders, James Chiesa, *Investing in Our Children: What We Know and Don't Know About the Costs and Benefits of Early Childhood Interventions*, RAND Corporation, 1998.

33.Carey, 2002.

Conclusion

The most current research findings indicate that increased investments in public education can produce substantial benefits in student achievement, particularly among low-income students. Because low-income students lag in academic achievement, and many poor school districts continue to receive funding levels below those of wealthier districts, high-poverty school districts represent both the greatest need for education funding and the greatest opportunity to improve student outcomes. Recent analyses of the cost of closing the achievement gap in these schools indicate that while many states are providing *some* funding in pursuit of these goals, few, if any, are providing *enough* money to fully compensate for the educational barriers associated with poverty. The recent experience in Maryland demonstrates that significant poverty-based reforms in education finance are politically acceptable, although Maryland still faces the challenge of funding the reforms fully. Researchers should continue to explore these issues and refine estimates of the cost of educating poor students, while policymakers can use these results to target additional educational resources that become available.

ENDNOTES

1.J.S. Coleman, E.Q. Campbell, C.J Hobson, J. McPartland, A.M. Mood, F.D.Weinfeld, R.L.York, *Equality of Education Opportunity*, 1966.

2.G. Cain, and H. Watts, "Problems in making policy inferences from the Coleman report," *American Sociological Review*, 35, 1970.

3.Richard Rothstein and Karen Hawley Miles, *Where's The Money Gone? Changes in the Level and Composition of Education Spending*, Economic Policy Institute, 1995.

4.Richard Rothstein, *Where's the Money Going? Changes in the Level and Composition of Education Spending, 1991-96*, Economic Policy Institute, 1997.

5.*Digest of Education Statistics 2001*, Table 137, U.S. Department of Education, National Center for Education Statistics, 2002; *The Condition of Education 1996*, Supplemental Table 22-1, U.S. Department of Education, National Center for Education Statistics, 1997.

6.*The Condition of Education 2001*, U.S. Department of Education, National Center for Education Statistics, 2002.

7.For example, Ronald Ehrenberg, Dominic J. Brewer, Adam Gamoran, J. Douglas Williams, "Class-size and Student Achievement," *Psychological Science in the Public Interest*, 2001.

8.*Digest of Education Statistics 2001*, Table 108, U.S. Department of Education, National Center for Education Statistics, 2002.

9.Eric Hanushek, "The Impact of Differential Expenditures on School Performance", *Educational Researcher*, 1989.

10.Rob Greenwald, Larry V. Hedges, Richard D. Laine, "Does Money Matter? A meta-analysis of studies of the effects of differential school inputs on students outcomes," *Educational Researcher*, 1994.

11.RobGreenwald, Larry V. Hedges, Richard D. Laine, "The Effect of School Resources on Student Achievement," *Review of Educational Research*, 1996.

12.Kevin Carey, *State Poverty-Based Education Funding: A Survey of Current Programs and Recommendations for Improvement*, Center on Budget and Policy Priorities, 2002.

13.For example, James Guthrie and Richard Rothstein, "Enabling 'Adequacy' to Achieve Reality, Translating Adequacy into State School Finance Distribution Arrangements," *Equity and Adequacy in Education Finance: Issues and Perspectives*, National Academy Press, 1999.

14.Maryland Commission on Education Finance, Equity, and Excellence, *Final Report*, Annapolis, Maryland, 2002.

15.New revenues for the first two years of the six-year implementation plan were raised through an increase in the state cigarette tax. New revenues have not yet been identified to support the final four years of the plan, in which the majority of the increased funding is scheduled to be provided.

16.Andrew Reschovsky and Jennifer Imazeki, "The Development of School Finance Formulas to Guarantee the Provision of Adequate Education to Low-Income Students," *Developments in School Finance 1997*, National Center for Education Statistics, 1997.

17.William Duncombe, *Estimating the Cost of an Adequate Education In New York*, Center For Policy Research Working Paper, Syracuse University, 2002.

18.Greenwald, et. al., 1996.

19.Elizabeth Word, John Johnston, Helen Bain, D.B Fulton, J. Boyd-Zaharias, Nan Lintz, Charles M. Achilles, John Folger, and C. Breda, *Student Teacher Achievement Ratio (STAR): Tennessee's K-3 class-size study*, Tennessee State Department of Education, 1990.

20.Alan Krueger and Diane Whitemore, "The Effect of Attending a Small Class in the Early Grades on College Test Taking and Middle School Test Results: Evidence from Project STAR," *The Economic Journal*, 2001.

21.Alex Molnar, Philip Smith, John Zahorik, Anke Halbach, Karen Ehrle, Lawrence M. Hoffman, Beverly Cross, *2000-2001 Evaluation Results of the Student Achievement Guarantee in Education (SAGE) Program*, Center for Education Research, Analysis, and Innovation, 2001.

22.Brian M. Stecher and George W. Bohrnstedt, *Class size Reduction in California: Summary of Findings from 1999-00 and 2000-01*, CSR Research Consortium, 2002.

23.Christopher Jepsen and Steve Rivkin, *Class Size Reduction, Teacher Quality, and Academic Achievement in California Public Elementary Schools*, Public Policy Institute of California, 2002.

24.Ronald Ferguson and Helen F. Ladd, "How and Why Money Matters: An Analysis of Alabama Schools," *Holding Schools Accountable*, Helen Ladd ed., Brookings Institution, 1996.

25.David Grissmer, Ann Flanagan, Jennifer Katawa, Stephanie Williamson, *Improving Student Achievement: What State NAEP Test Scores Tell Us*, RAND Corporation, 2000.

26.Greenwald, et. al., 1996.

27.Linda Darling-Hammond, *Teacher Quality and Student Achievement: A Review of State Policy Evidence*, University of Washington Center for the Study of Teaching And Policy, 1999.

28.Ronald Ferguson, "Paying for Public Education: New Evidence on How and Why Money Matters," *Harvard Journal on Legislation*, Summer 1991.

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

[X] This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

[ ] This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").